

EFFECT OF AN ACIDIFIED DIET ON *SALMONELLA* PREVALENCE DURING THE LAST TERM OF FATTENING PERIOD

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Abstract The objective of this study was to determine the effect of the acidification of pelleted feed on the carriage and seropositivity against *Salmonella* in finisher pigs of a commercial herd.

Three different diets were assayed: 0.8% formic acid (group 1); 0.4% lactic acid plus 0.4% formic acid (group 2) and a feedstuff without additives (group 3). One thousand pigs were included in each treatment that was administered from 19 to 26 weeks of age. Blood, faecal content and mesenteric lymph nodes were collected at slaughter (30 pigs/group). The diet including lactic and formic acids significantly reduced *Salmonella* seroprevalence compared to the diet without additives ($p < 0.05$) but there were no differences on the faecal excretion or in *Salmonella* carriage in mesenteric lymph nodes. Our results suggest that the administration of a combination of lactic and formic acids at the levels used in this study can be helpful to reduce *Salmonella* prevalence in finishing pigs.

Introduction Feeding strategies have shown to be effective for reducing the incidence of *Salmonella* in pigs when combined with other measures such as hygiene and adequate management practices. Several studies reported that meal feed had a protective effect against subclinical *Salmonella* infection in pigs. However, these diets have a negative effect on the productivity (Kjeldsen and Dahl, 1999; Wondra *et al.*, 1995). Meal feed allows optimal conditions for the production of organic acids in the gastrointestinal tract of pigs. These acids are known to inhibit *Salmonella* (van Winsen *et al.*, 2001). High levels of organic acids in the gut can be also achieved through the acidification of feed. The aim of this study was to examine the effect of using pelleted feed added with organic acids for the last weeks prior to slaughter, on the prevalence of *Salmonella* in age-market pigs of a commercial herd.

Materials and Methods The study was carried out in a commercial herd subclinically infected with *Salmonella*. Before starting the administration of the experimental diets, serological analysis indicated that, at 17 weeks of age, at least 20% of pigs were seropositive. From previous studies a 40% seroprevalence was expected when pigs were 26 weeks old.

Three groups were included in the trial. Group 1 received a commercial pelleted feed added with 0.8% formic acid; group 2 received the commercial feed added with 0.4% lactic acid plus 0.4% formic acid and group 3 received the commercial feed without additives. Each group had 1,000 finishing pigs. Diets were administered for the last seven weeks before the slaughter of the pigs (from 19 to 26 weeks of age). The effect of the three diets on *Salmonella* prevalence was measured by analyzing samples from 30 pigs/ group (blood, faecal contents and mesenteric lymph nodes). Samples were taken at the slaughterhouse and carcass weights were also recorded. With this sampling we expected to be able to determine a reduction of prevalence from 40% in untreated pigs to 20% in treated pigs (95% confidence level, 80% power).

Serum samples were tested by an indirect mix-ELISA based on the O-antigens 1, 4, 5, 6, 7 and 12, using a cut-off of 40% of the positive control. Bacteriological analysis were done by means of an initial enrichment of samples in buffered peptone water, transfer to Rappaport-Vassiliadis broth (42°C, 48 h) and final plating onto XLT4 medium. Final identification was done by means of the API20E test and serotyping.

Results At the end of the study the highest seroprevalence was observed in group 3 (28/30, 93.3%) followed by group 1 (26/30, 86.6%) and group 2 (20/30, 66.6%). These differences were statistically significant ($p = 0.02$). Tukey test for multiple comparisons showed that seroprevalence in group 2 was different from that of the controls ($p = 0.019$) and showed a trend to be different from group 1 ($p = 0.05$). In contrast, no differences were seen in the faecal or lymph node carriage (Table 1). Two *Salmonella* serovars were isolated from faeces: Typhimurium and its monophasic

variant 4,12:i:- and Muenchen, whereas from ileocecal lymph nodes only the Typhimurium monophasic variant was isolated. Interestingly, only one of the animals with lymph node carriage was also positive in faeces. No differences in productive records were observed.

Discussion Several studies have shown the importance of the finishing period for the diffusion of *Salmonella* infections in swine herds, particularly when those infections happen shortly before the slaughter. This fact suggests that prevention in that critical period can be helpful to reduce the proportion of carrier pigs reaching the slaughterhouse. Our results showed that acidification of feed was efficient to reduce *Salmonella* seroprevalence, indicating thus that treatment of group 2 (lactic plus formic acids) was helpful to reduce, or at least to slow, the spread of the infection. However, the proportion of *Salmonella* carriers was similar in all groups. This discrepancy of results needs explanation. One possible interpretation is that pigs that had become infected before the administration of the acidified feed and developed a carrier state were not affected by the treatment. In favor of this hypothesis it can be stated that lymph node carriage was low (1-2 pigs/group). In addition, some of these infections could have taken place during the transport and waiting in the slaughterhouse. Hurd *et al.*, (2001) showed that after a brief exposure to a *Salmonella*-contaminated environment, pigs can be infected and *Salmonella* can be recovered from faeces. As shown in our results, of the total 14 culture positive faeces, only one corresponded to lymph node carriers. This picture would agree with a recent infection, maybe during transport and waiting at the slaughterhouse.

Conclusions Our results show that adding a combination of 0.4% lactic acid plus 0.4% formic acid to a commercial pelleted feed during the last term of fattening period can be helpful to reduce *Salmonella* prevalence in finishing pigs. Although the protective effect of acidified feed, this feeding strategy should be applied in combination with other general measures in farm the entire fattening period.

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Parameters	0.8% formic acid diet	0.4% lactic acid + 0.4% formic acid diet	Non acidified diet
Blood samples	26 (86.6)	20 (66.6)	28 (93.3)
Faeces	5 (16.6)	5 (16.6)	4 (13.3)
Mesenteric lymph nodes	1 (3.3)	2 (6.6)	2 (6.6)

Table 1. Effect of the examined diets on *Salmonella* prevalence. Number of positive samples (%)